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(71) Applicant
Combi Box System AB

(Incorporated in Sweden)

V:a Hindbyvägen 14, S-214 58 Malmo, Sweden

(72) Inventor
Lennart C B Jonsson

(74) Agent and/or Address for Service
Gill Jennings & Every
53-64 Chancery Lane, London, WC2A 1HN,
United Kingdom

(54) **Service system for a plurality of separated docking places**

(57) A service system for a plurality of docking places for such craft as airplanes, ships and the like which require the supply of different utilities, such as fuel, water, air and electric power, and the removal of waste, such as wastewater, comprises a plurality of boxes (3) countersunk in the ground on each docking place. Each of said boxes has a coverplate (37) which is located on ground level and over which the craft can be driven, and each box accommodates connection means (36; 41) for connecting a supply or discharge line (4) opening into a respective box and disposed below ground level, to a corresponding input or output of the craft. Flexible extension means (35; 40) are provided in at least some of the boxes between said line and said connection means. A plurality of distributing lines are disposed below ground level and connected both to a respective one of said supply and discharge lines and to a respective source for a utility and a waste receiver, respectively. A control centre through which at least some of the distributing lines pass comprises monitoring equipment for the conveyance of utilities and waste through said lines.

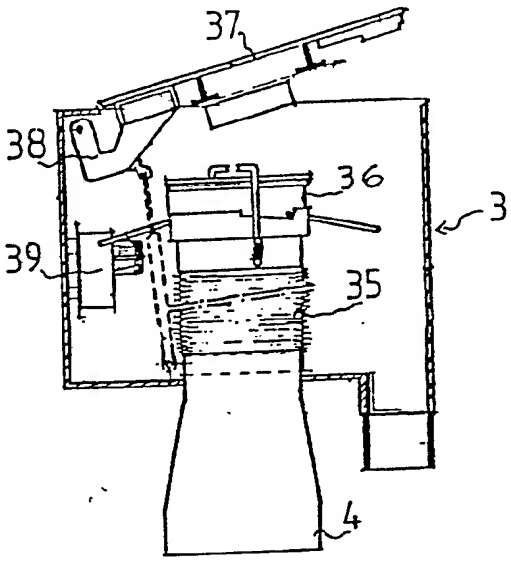

FIG 7

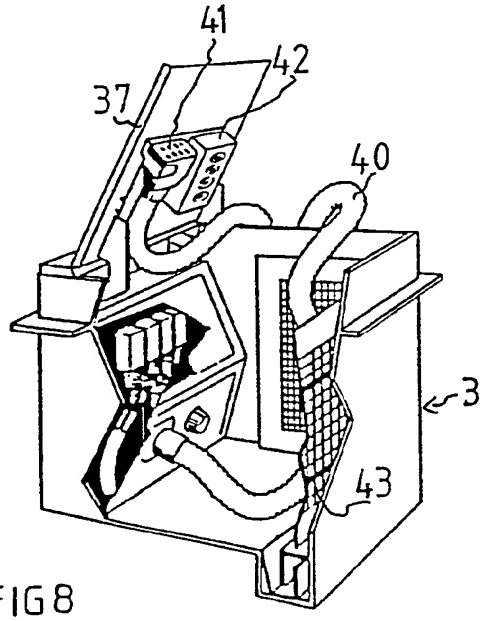

FIG 8

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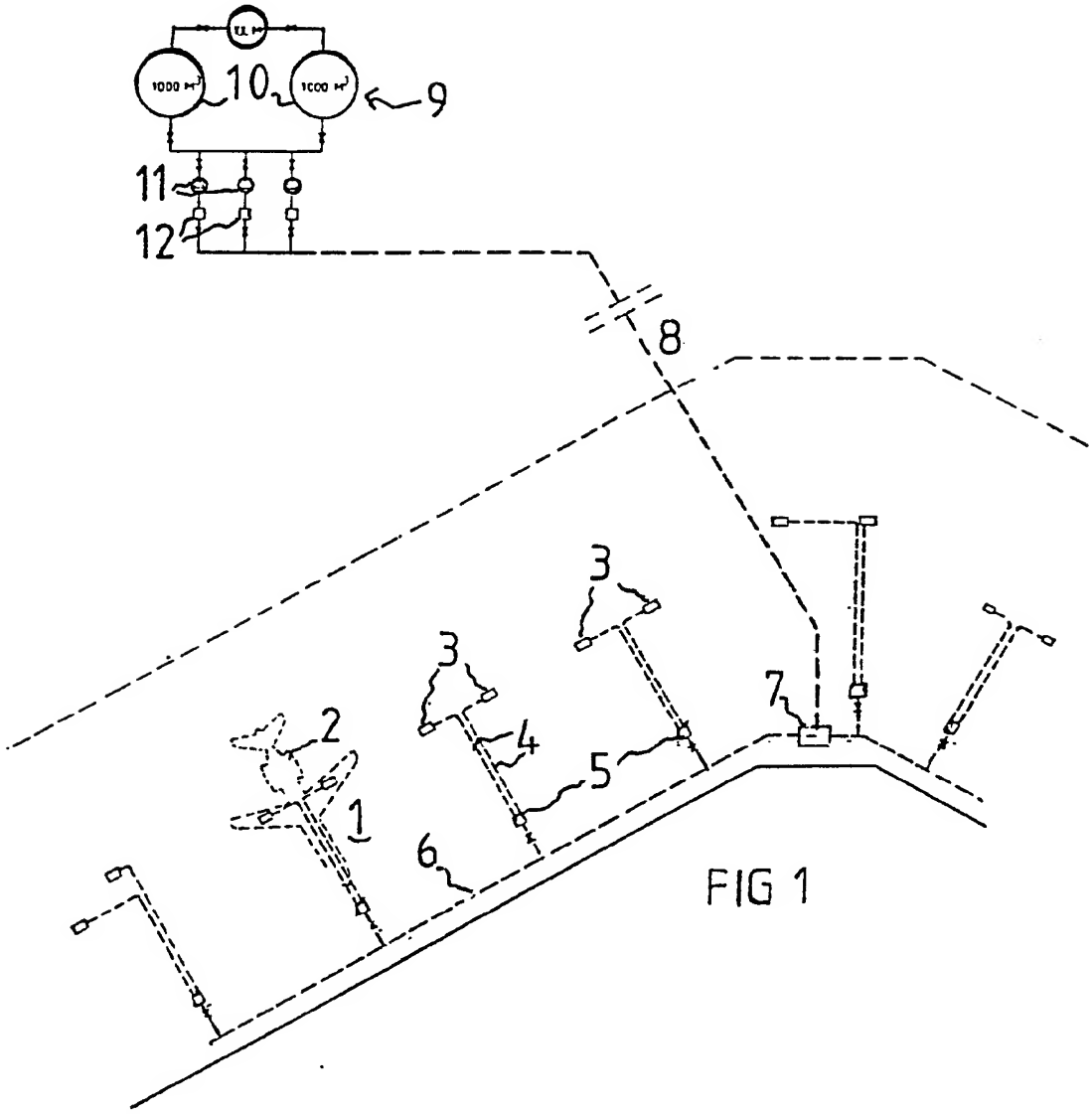


FIG 1

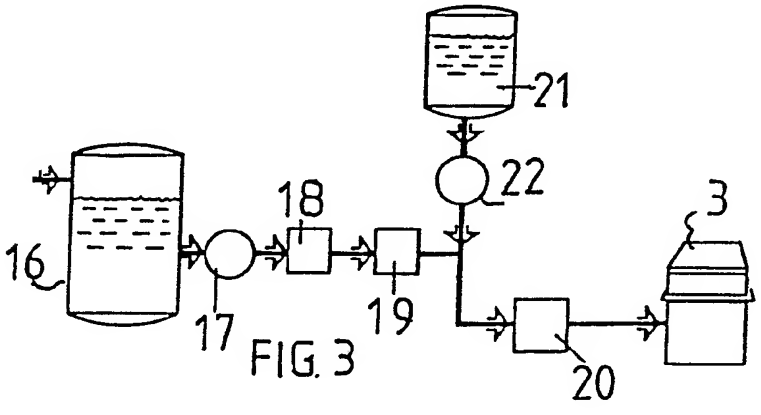


FIG. 3

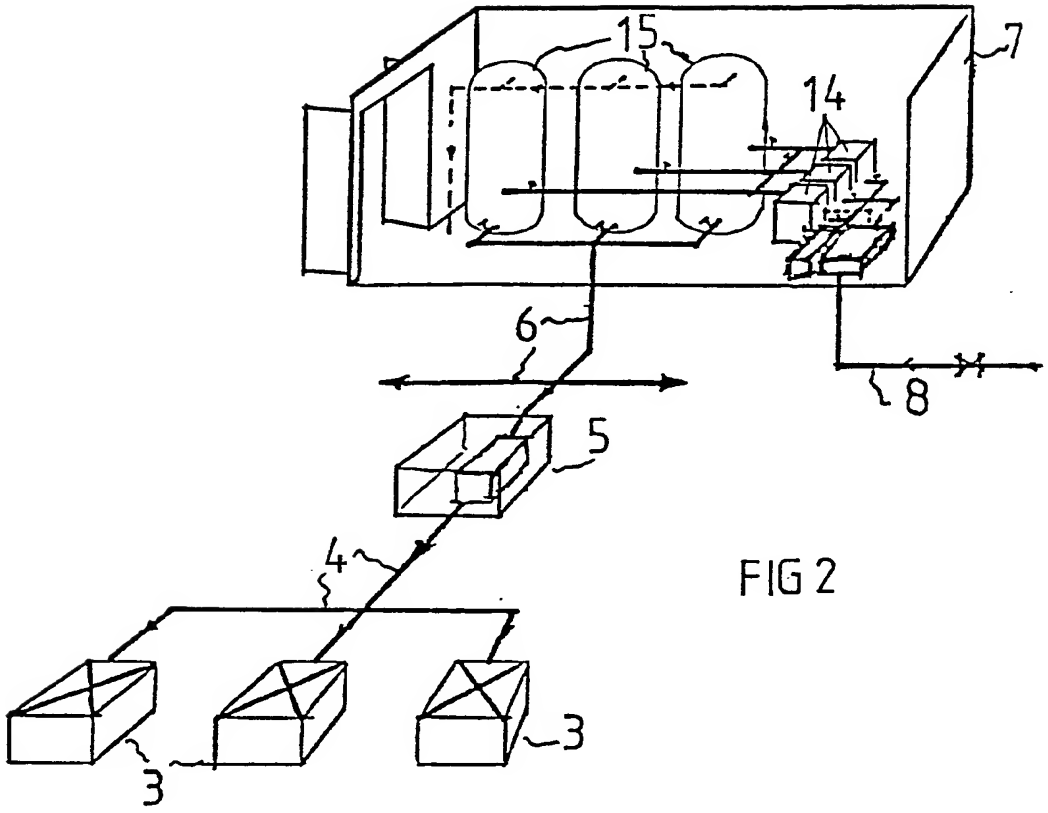


FIG 2

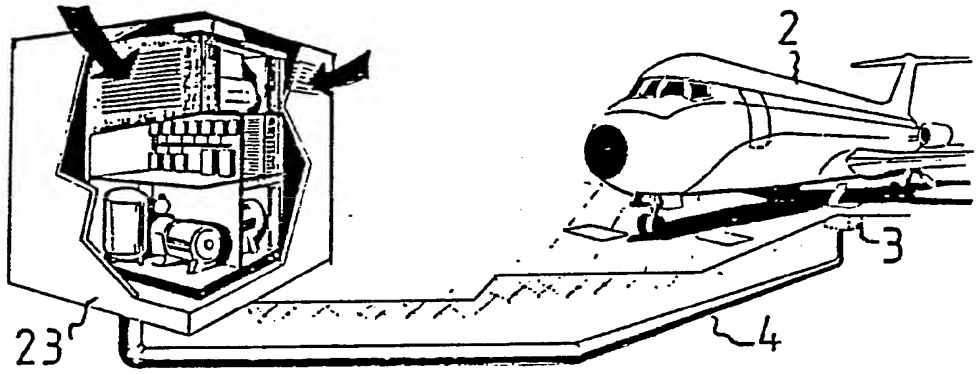


FIG 4

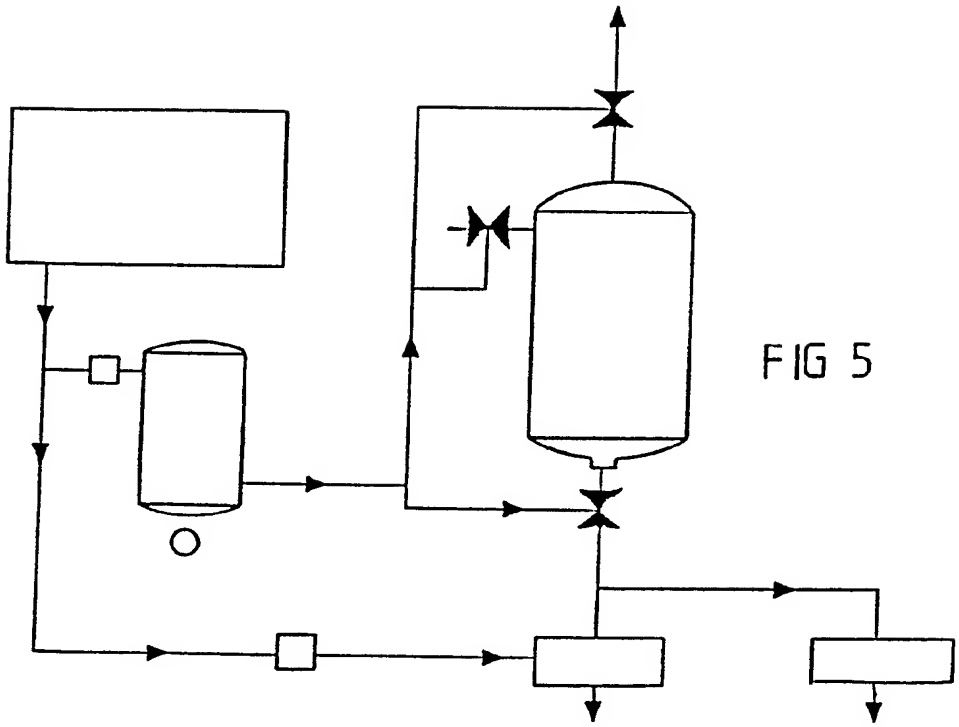


FIG 5

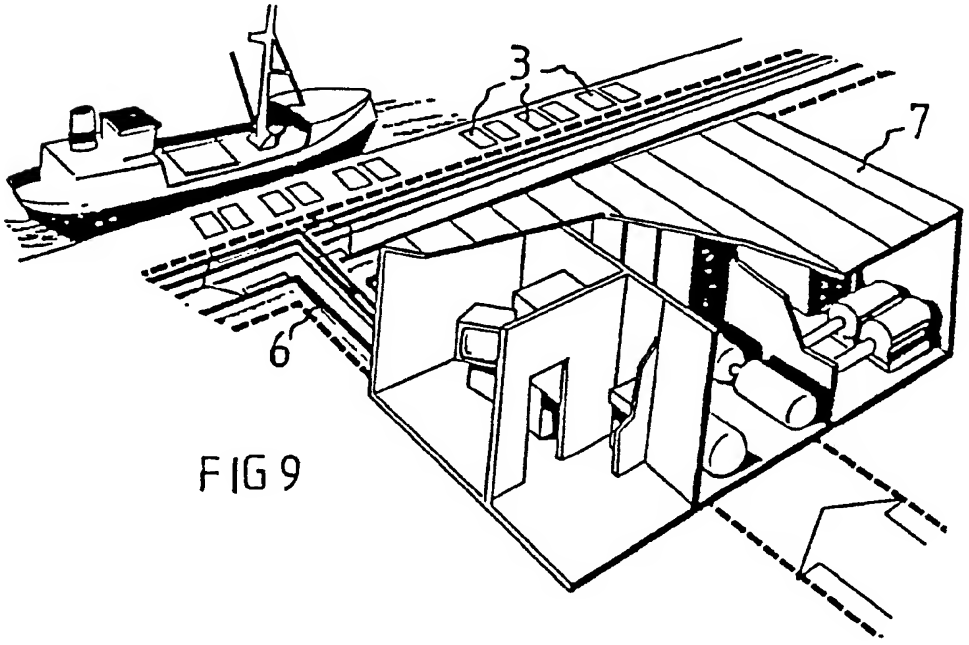
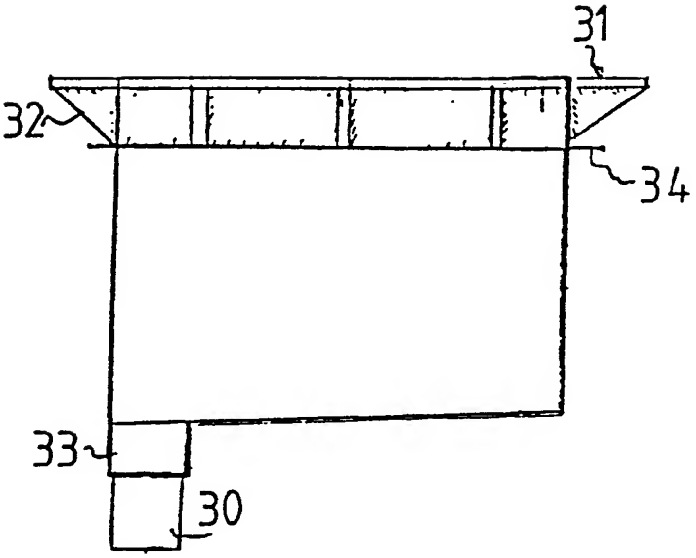


FIG 9

FIG 6 a



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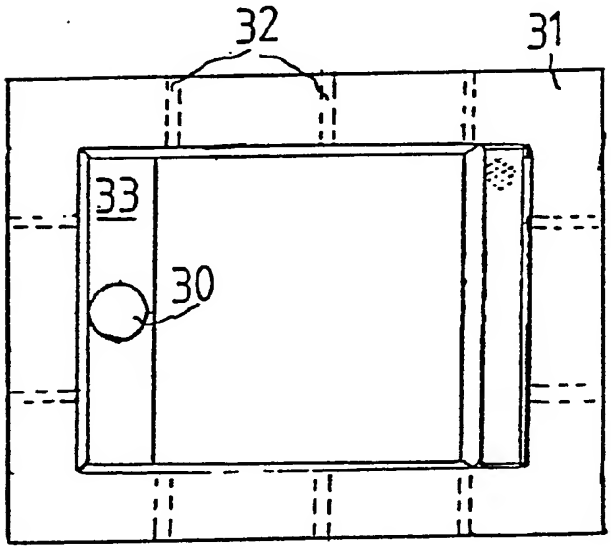

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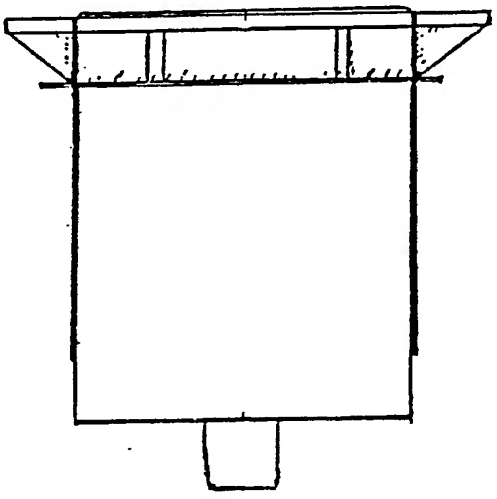

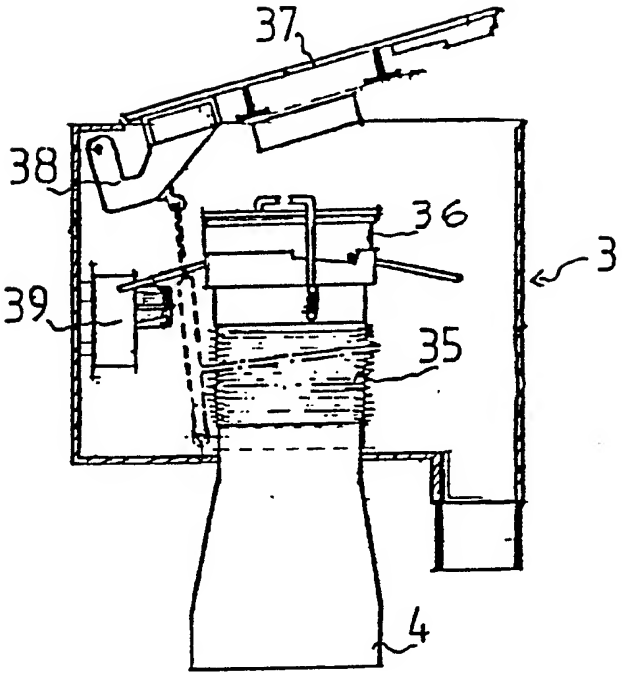

FIG 7

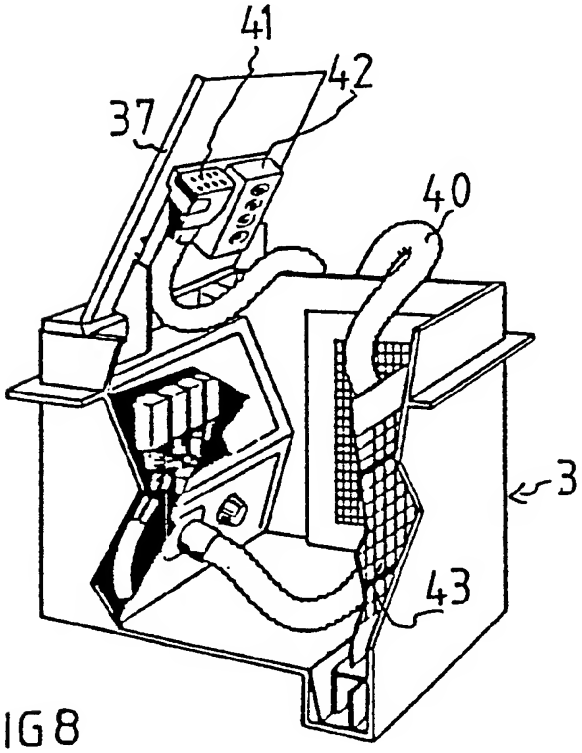

FIG 8

A FIXED SERVICE SYSTEM FOR A PLURALITY OF SEPARATED DOCKING PLACES FOR DIFFERENT CRAFT

The present invention generally relates to a service system for different craft, which system is fixed in relation to a plurality of stationary docking places for the craft. The system is used for the supply of utilities to and the removal of waste from such craft as airplanes, ships and caravans.

Fixed systems for supplying electric power to parked aircraft have been suggested as a means for cutting the time of operation of the auxiliary power unit (APU) of the aircraft, which is today installed in most jet planes. Such systems do however not cut the turnaround time of the aircraft at the airport.

The prior art technique has not been able to solve the problems relating to the presence of several service vehicles on the apron. The use of service vehicles contributes to an extended turnaround time of the aircraft and, thus, to a low capacity of the airport. Additionally, the service vehicles constitute a safety risk. The invention therefore primarily aims at providing a fixed service system which, in the first place, should cut the turnaround time and, in the second place, should eliminate the risks linked with the use of conventional service vehicles.

The solutions achieved by the invention will appear from the accompanying claims.

As appears from the above, the service system of the invention means that all connections are directly accessible on the apron, this eliminating the need of any service vehicles thereon. The boxes on the apron will not form any obstacles when the coverplates are locked, but offer convenient access to e.g. fuel, water, air and electric power, when the aircraft is parked. Thus, the invention makes it pos-

sible to reduce the noise level, hoses and vehicles are not needed on the apron, this reducing the risk of fire and of collisions. Since no service vehicles are on the apron and, hence, cannot obstruct each other, service operations can be carried out independently from the different boxes.

The service system according to the invention also means a shortened turnaround time on the apron, whereby the aircraft can be used to a more efficient extent.

The monitoring equipment, including e.g. control, metering and recording equipment, disposed in the control centre makes it possible to easily record the use of the different utilities and, hence, to distribute the costs on the basis of factual use.

Naturally, the increased safety, the increased capacity and the improved recording also mean considerable cost-savings.

The service system according to the invention is useful not only in airports, but may also be used equally well in harbours, on camping sites and like contexts.

The present invention will be described in more detail hereinbelow with reference to the accompanying drawings.

Fig. 1 is a schematic top plan view of a section of an airport. Fig. 2 is a perspective view of the fuel supply unit in the service system according to the invention. Fig. 3 is a block diagram of the freshwater unit in a service system according to the invention. Fig. 4 is a perspective view of an air-conditioning unit in the service system according to the invention. Fig. 5 is a block diagram of a central vacuum unit of a waste disposal plant included in the service system according to the invention. Figs. 6a-6c are a side view, a top plan view and a front view, respectively, of a box used in the service system. Fig. 7

illustrates an example of a box included in the system for air-conditioning purposes. Fig. 8 shows an example of a box included in the system for power supply purposes. Fig. 9 is a perspective view schematically showing the use of the system in a harbour.

Fig. 1 shows the basic concept of the invention used in an airport.

The airport has several aprons, each constituting a docking place 1 for an aircraft 2. According to the invention, each docking place is provided with a plurality of boxes countersunk in the ground and having a coverplate located on ground level.

For greater clarity, Fig. 1 solely shows boxes 3 for supplying one utility, in this case fuel, to the aircraft 2. An actual docking place 1 would thus have many more boxes 3 than those shown in Fig. 1.

Fuel supply lines 4 pass from the boxes 3 via a fuel meter 5 for each apron to a fuel distributing line 6 common to several aprons. The distributing line 6 terminates in a control centre 7 containing e.g. a filter unit for the fuel. The fuel is supplied to the control centre 7 and its filter unit through a supply main 8 from a fuel store 9 having several cisterns 10. A plurality of pumps 11 and filters 12 are connected between the fuel store 9 and the control centre 7.

With the exception of the control centre 7 and the fuel store 9, the entire system is disposed underground. In larger installations, the distributing line 6 can be disposed in a special culvert together with the other distributing lines.

The operation of the service system will now be described in more detail with reference to Fig. 1. When an aircraft 2 has landed on the airport, it is parked in a conventional manner on the apron 1 where the passengers can leave the aircraft in a customary manner and new passengers go on board. When the aircraft 2 has parked on the apron, the coverplates of the diffe-

rent boxes 3 to be used are opened. For example, the coverplates are opened on two boxes 3 which each accommodate a connection means for connecting the fuel supply line 4 to a fuel intake on the aircraft 2. To allow such connection, each box 3 contains flexible extension means in the form of a tube provided between the fuel supply line 4 and the connection means.

Similarly, connection means in other boxes 3 for water, e.g. fresh water, air, e.g. for air-conditioning, and electric power can be connected to corresponding intakes on the aircraft. Also, toilet waste from the aircraft 2 can be removed through a special box 3 connected to an evacuation system by special discharge lines.

It is evident that the use of a service system of the type now described means that no service vehicles at all are needed on the apron 1 and so, the aircraft 2 can be served very rapidly and the turnaround time can be considerably reduced, which means that the aircraft can be utilized to a more efficient extent and costs can be cut.

Fig. 2 is a perspective view showing a practical embodiment of the fuel supply part of a service system according to the invention. Fig. 2 shows in more detail the equipment of the system included in the control centre 7 to ensure fuel supply. As appears from Fig. 2, the control centre 7 more specifically contains a pressure control equipment through which the fuel from the fuel store 9 and the supply main 8 is first supplied to a number of coarse filters 14 and thereafter to a number of filter separators 15 before the fuel, via the distributing line 6, the fuel meter 5 and the fuel supply lines 4, reaches the fuel supply boxes 3.

Fig. 3 is a general view showing how fresh water can be supplied by means of the service system according to the invention. A central water-storage tank 16 is supplied from the local water mains. By means of a pump 17, the water is discharged from the tank 16 through a pressure-reducing unit 18 and pH-determining units

19, 20, out to a distributing line 6 and from these, via a supply line 4, to a connection means in a box 3. Between the pH-determining units 19 and 20, a line from a supplementary tank 21 is connected in series with a second pump 22. By suitable additions from the tank 21, it is possible e.g. to maintain the pH of the fresh water at a desired level.

This part of the service system makes it possible to deliver cool fresh water directly to the apron irrespective of the outdoor temperature.

Although it is not illustrated in the drawings, the system of course includes equipment for metering and recording the amounts of water supplied, such that central recording thereof can be made in the control centre 7.

Fig. 4 is a perspective view of an air-conditioning unit included in the service system according to the invention. As will have been appreciated from the above, the fuel supply system and the water supply system are of the centralized type, whereas the air-conditioning system according to Fig. 4 is of the decentralized type. Thus, use is made of an air-conditioning unit 23 for a single aircraft or for two aircraft parked beside each other.

The air-conditioning unit 23 is capable of providing sufficient cold in hot climates and sufficient heat in cold climates and may also be designed so as to be able to provide both cold and heat. By the fixed installation near the apron and a connection through an underground supply line 4 to a box 3 on the apron, a most cost-effective system will be achieved with low costs for installation and operation. The stationary air-conditioning unit, which is directly connectible to the aircraft 2 via the supply line 4 and the box 3, is most advantageous as compared with conventional systems using an APU, and also as compared with a pneumatic system. The costs of operation can thus be dramatically cut and from the control centre

7, the air-conditioning of the aircraft 2 can be optimized by using available heating/cooling sources. Naturally, the system also makes it possible to control the humidity of the air supplied to the aircraft.

Fig. 5 shows a central vacuum unit which is included in the service system of the invention and can serve several aprons. The vacuum unit contains a vacuum pump and a collecting tank. Control equipment is also provided for automatic and manual operation. The whole vacuum unit may be included in the control centre 7.

The vacuum system for waste disposal also allows simple drainage of all boxes 3 of the system. Since at least one box 3 contains a suction line connection for discharge of waste, this suction line can also be connected to the bottom drain holes of all boxes 3 on the apron, whereby the boxes can be drained without any special drain pipes.

The waste disposal system also comprises a system for flushing the aircraft toilets in connection with the emptying thereof, and for flushing the discharge lines of the service system. The flushing system can also be used for washing other boxes.

Figs. 6a-6c show in more detail the design of a box 3, with the exception of its coverplate. The generally parallelepipedal box 3 has bent, welded-together walls of heavy metal plate and a bottom likewise of heavy metal plate. The bottom is inclined towards a drain hole 30. Around the upper edge of the box, there is provided a frame in the form of a steel flange 31 which takes up lateral forces from loads exerted on the coverplate and transmits the vertical forces to the ground surrounding the box. Thus, the box is always capable of taking up at least the loads which the surrounding pavement can withstand. Further, the flange 31 is fixed relative to the walls of the box by means of triangular brackets 32. The

drain hole 30 is located in the bottom of a gutter 33 in the lowermost portion of the bottom of the box 3. A further flange 34 projecting from the walls of the box 3 is mounted below the brackets 32. The flange 34 serves to fix the box 3 in the surrounding material. The box 3 can be provided with openings (not shown) in its sides or its bottom for allowing introduction of the supply or discharge line.

Fig. 7 is a cross-sectional view of a box 3 used for air-conditioning purposes. The air supply line from the heating/cooling unit 23 (Fig. 4) opens into the bottom of the box 3 and is there connected to one end of a flexible tube 35 the other end of which is connected to connection means 36. The coverplate 37 of the box 3 is mounted in hinges 38 which are relieved of any load when the coverplate is closed. In its closed position, the coverplate 37 rests more specifically on the upper edges of the walls of the box 3. Further, the coverplate 37 is normally locked in its horizontal, closed position but, after unlocking, it can easily be raised to an open position in which it remains while the box is used.

When an aircraft 2 parked on the apron 1 should be connected to the heating/cooling unit 23, the coverplate 37 is thus opened, whereupon the connection means 36 is lifted out of the box and connected to an air intake on the outer side of the aircraft. This is easily done thanks to the flexible tube 35. The air-conditioning process is thereafter started with the aid of operating means 39 in the box 3. The same operating means 39 is used for interrupting the air-conditioning process, whereupon the tube 35 and the connection means 36 are again placed in the box 3, and the coverplate 37 is closed.

Fig. 8 is a perspective view with certain parts broken away, showing a box 3 in the service system according to the invention. This box is used for supply-

ing electric power to the aircraft when parked on the apron 1. The box 3 is of the same design as shown in Figs. 6a-6c, although the components 31 and 32 are excluded from Fig. 8. Electric cables are previously arranged for connection to the box 3, more specifically to connection means 41, via flexible extension means 40. The connection means 41 can be fixed to the underside of the coverplate 37. The coverplate is also provided with operating means 42 for switching on or switching off the power. Fig. 8 also shows a heating cassette 43 making the interior of the box frostproof, also at outdoor temperatures of down to -45°C.

Fig. 9 schematically shows the service system according to the invention used in a harbour.

CLAIMS

1. A service system for a plurality of separated docking places (1) for such craft as airplanes (2), ships and the like, which require the supply of different utilities, such as fuel, water, air and electric power, and the removal of waste, such as wastewater, which system comprises a plurality of boxes (3) countersunk in the ground on each docking place, each of said boxes having a coverplate (37) which is located on ground level and over which the craft can be driven, each box accommodating connection means (36; 41) for connecting a supply or discharge line (4) opening into a respective box and disposed below ground level, to a corresponding input or output of the craft, flexible extension means (35; 40) being provided in at least some of the boxes between said line and said connection means; a plurality of distributing lines (6) disposed below ground level and connected both to a respective one of said supply and discharge lines and to a respective source (9) for a utility and a waste receiver, respectively; and a control centre (7) through which at least some of the distributing lines pass and which comprises monitoring equipment for the conveyance of utilities and waste through said lines.

2. Service system as claimed in claim 1, which comprises as air-conditioning source a heating/cooling unit (23) for each docking place (1) or each pair of docking places, said unit being connected directly to a supply line (4).

3. Service system as claimed in claim 1 or 2, wherein the control centre (7) comprises a fuel-filter unit (14, 15) connected before the fuel distributing line (6), and wherein the monitoring equipment com-

prises meters (5) for recording the fuel supplied to each docking place.

4. Service system as claimed in any one of claims 1-3, wherein each docking place (1) has several boxes (3) for at least one of the utilities and the waste, respectively.

5. Service system as claimed in any one of claims 1-4, wherein each box (3) has operating means (39; 42) for starting and stopping the supply or the discharge.

6. Service system as claimed in any one of claims 1-5, wherein the boxes (3) accommodating the flexible extension means (40) have an attachment for the connection means (41) on the underside of the coverplate (37).

7. Service system as claimed in any one of claims 1-6, wherein each box (3) has a flange (31) surrounding the coverplate and braced (32) against the walls of the box.

8. Service system as claimed in any one of claims 1-7, wherein each docking place (1) has at least one box (3) containing a suction line connection for the disposal of waste, and each box has a bottom drain hole (30) connectible to the suction line for draining the box.

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